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ABSTRACT

The Education for Economic Security Act requires state education agencies to submit comprehensive needs assessments in order to receive the funding provided by Title II of the Act for improvements in mathematics, science, computer learning, and foreign language instruction. Areas of need covered in this summary include: the qualifications of current teaching staff; the adequacy and availability of curricula and materials; and the degree of access to instruction in the four subject areas by historically underserved or underrepresented student populations. Also included is an overview of programs and initiatives designed to address those needs. In general, it appears that the legislation has prompted states to consider needs and develop initiatives in all four subject areas, with the greatest efforts focused on mathematics and science instruction. Many teachers of specific computer courses are self-taught, and the states see an increasing need for formal instruction. Foreign language instruction remains minimal at both the elementary and secondary levels in many states. In addressing the issue of access to instruction by historically underserved student groups, the states seem concerned primarily with increasing the enrollment of females and ethnic minority students in advanced mathematics and science courses. (MLF)

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STATE NEEDS ASSESSMENTS, TITLE II EESA: A SUMMARY REPORT

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EXECUTIVE SUMMARY

The Education for Economic Security Act (P.L. 98-377), passed in 1984, requires State education agencies to submit comprehensive needs assessments in order to receive the funding provided by Title II of the Act for improvements in mathematics, science, computer learning, and foreign language instruction. This report summarizes the State needs assessment information. The conclusions are based on both a quantitative summary of tabular data from States that used the same measures of needs and a qualitative analysis of data from States that used different measures of the same needs. The areas of need covered in this summary include: the qualifications of current teaching staff; the adequacy and availability of curricula, materials, and equipment; and the degree of access to instruction in the four subject areas by historically underserved or underrepresented student populations. Also included is an overview of programs and initiatives designed to address those needs.

In general, it appears that the EESA Title II legislation has prompted States to consider needs and develop initiatives in all four subject areas, with the greatest efforts focused on mathematics and science instruction. Specifically, many States reported that a significant number of elementary teachers lack sufficient background knowledge in science and that elementary teachers need to improve their instructional techniques in mathematics. In addition, States commonly reported a need for more materials and equipment to supplement elementary science instruction. Although many States are aware of the need for improvements at the elementary level, only a few have actually begun to implement initiatives.

States reported that secondary mathematics and science teachers indicated a need for additional inservice training to keep abreast of current information, and many States noted that they have undertaken initiatives to reinforce the content knowledge of these secondary level teachers.

State assessments of computer learning instruction reveal a more fundamental level of need for improvement than that seen in math and science. While a number of States currently are developing curricula for computer learning, many States have not yet approved this area as a separate subject of instruction. As a result, many teachers teaching specific computer courses are self-taught, and the States see an increasing need for formal instruction. The more common perspective was to view computers as a tool for instruction in other subjects, and nearly half the States reported they had existing programs in this area. Furthermore, as microcomputers are brought into

greater use in the classroom, more States have recognized a need for additional hardware and software.

Foreign language instruction remains minimal at both the elementary and secondary levels in many States. Nevertheless, most States did not perceive a need to upgrade instruction at the elementary level. The most frequently mentioned program initiative at the secondary level was the attempt to provide a minimum level of foreign language instruction in all high schools.

In addressing the issue of access to instruction by historically underserved student groups, the States seem concerned primarily with increasing the enrollment of females and ethnic minority students in advanced mathematic and science courses. Most programs for improvement are initiated at the local rather than State level and usually rely on the encouragement of students by teachers as the stimulus for change. Few States reported efforts to improve opportunities for gifted students in advanced mathematics and science instruction, but in those that have developed initiatives, State schools and academies seem to be the preferred avenues of access.

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INTRODUCTION

Educational reform has been in the spotlight over the past few years. Many of the initial reports concerned about the quality of the educational system in this country linked the need for improvement to the rapid growth and convergence of world economic trends, the new markets emerging from technological developments, and the need for a scientifically trained, technologically sophisticated labor force to compete in today's world. The focus on technological growth and foreign competition particularly underlined the need for improvements in the study of mathematics, science, technology, and foreign languages so that the country can compete in the world marketplace.

In 1984, Congress passed the Education for Economic Security Act (P.L. 98-377) to stimulate attention to the need for improvement in these areas of education. Title II of the act provides funds for States and local school districts to address needs in mathematics, science, foreign languages, and computer learning at the elementary/secondary and post-secondary levels within public and private schools. The statute required States to conduct a needs assessment in order to obtain funds under Title II. States were required to assess and make projections on the availability of teachers, on the qualifications of those currently teaching in these areas, on the availability of adequate curricula, materials, and equipment, and on the degree of access to instruction by historically underrepresented and underserved groups and by the gifted and talented. Programs and initiatives for improvement in these areas were also to be described. Beyond specifying consultation with various groups, neither the statute nor the regulations defined either the sources of data nor the indicators to be used to measure needs in these areas. The resulting needs assessment reports from the fifty States, the District of Columbia (D.C.) and Puerto Rico, are highly idiosyncratic and do not readily lend themselves to national generalizations. Some States conducted surveys of teachers, others of district administrators. Some pulled information from existing State databases while others relied on the judgments of SEA personnel. In few cases were the same indicators used to measure needs in any area.

In an attempt to promote some uniformity and in the hopes of developing some generalizable data, the Council of Chief State School Officers (CCSSO), with support from the National Science Foundation, developed a detailed questionnaire to address these issues. What uniformity exists in the State reports generally stems from the use of the tabular response shells from the CCSSO's survey to fulfill the needs assessment requirements. Private school data were generally unavailable, and the post-secondary institutions in many States apparently had difficulty responding to the questions as

defined. Thus any attempt to summarize the State information must be limited to public elementary and secondary needs and programs in mathematics, science, foreign languages, and computer learning. In addition, because of the inconsistency in reporting five-year projections, only current needs will be summarized. The CCSSO has issued a report that focuses on the question of teacher availability, using information on certification, recruitment, and retention. To avoid duplication of effort and because the CCSSO information is more complete in that area, data from the needs assessment reports on teacher certification and supply and demand issues will not be summarized here.

State needs in the areas of the qualifications of current teaching staff, adequate curricula, including instructional materials and equipment, and the access of historically underserved student groups form the focus of this report. Programs and initiatives undertaken to address these needs are also described.

In each section, an attempt was made to characterize the general picture across States. Summary Statements are based on tabular information from States that use the same measures of needs or on qualitative analysis of data from States that used different measures of the same need. In any case, the problems in accurately assessing needs based on the information available from the various State reports are discussed. The overall objective is to provide a general context for the reader who wishes to put the needs described in a particular State into a somewhat broader perspective. While the scope of national needs, and initiatives to address them cannot be determined from these data, this summary report can provide a picture of the most common concerns and typical State activities in these areas.

NEEDS

Teacher Qualifications

The focus of this section is on the background knowledge and inservice training of elementary and secondary teachers in mathematics, science, foreign languages, and computer learning. The qualifications of teachers at the elementary and secondary levels in each State were measured and reported in such dissimilar formats that it was not possible to summarize these reports in tabular form. Thirteen States only provided information on the certification status of current teaching staff, which will not be discussed here. Of the remaining 37 States, 32 States and D.C. used tables from the

CCSSO survey and discussed teacher qualifications in terms of background knowledge for teaching at the secondary level and the number of hours of training and preparation for teaching at the elementary level. Four States and D.C. provided information on the number and/or percentage of teachers who have a major in the subjects they are teaching. Thirty-two States and Puerto Rico provided quantitative information not displayed in the CCSSO format or narrative descriptions of teacher qualifications.

An additional complication in summarizing the State reports is that many States provided raw data without a total figure or background information. For example, numerous States provided the number of teachers requesting inservice training by subject yet failed to include the total number of teachers by subject in their State. Finally, many States used terminology such as "moderate need," "high need," and "extreme need," for which they did not provide any definition.

The majority of States focused on their mathematics and science teachers at both the elementary and secondary levels. The data provided on the qualifications of foreign language and computer learning teachers are scarce, especially in the latter case. The State reports indicate the qualifications of teachers differ at each level and in each subject. In general, however, teachers seem to have the basic background knowledge in the subject they are teaching, yet are in need of inservice training in order to keep up to date with current information.

Elementary Level

Elementary school teachers seem to be better qualified in mathematics than in science, foreign languages, and computer learning in terms of their background preparation in the subject area, the number of hours of inservice training they have participated in, and the school districts' reports on perceived need of teachers for retraining and inservice training. However, elementary teachers have expressed a need for effective integration of problem solving and mathematics skills in their mathematics instruction.

The local educational agencies (LEAs) report that the need for staff development and retraining is greatest for elementary teachers in science. These teachers expressed the need to receive hands-on instruction in the use of new equipment and effective teaching of current information in science.

While there is a need for elementary school teachers to participate in inservice training in both science and mathematics due to the rapid advances in these fields, this seems to be more of a necessity for those teaching science.

In the case of elementary foreign language teachers, information regarding their qualifications was limited. In many States, foreign language instruction does not take place at the elementary level at all. The majority of LEAs who did provide reports on the qualifications of elementary school teachers of foreign languages rated them as having solid backgrounds in their fields, since most of the teachers have obtained either their major or minor degrees in foreign languages. Despite their background knowledge, however, school districts have reported these teachers' participation in staff development programs as insufficient.

Similar to the area of foreign language teachers, not all States provided data on elementary computer learning teachers. However, there is an adequate supply of information to form some generalizations on the qualifications of the computer learning teachers. According to the information provided by the States, the majority of teachers are in extreme need of staff development programs. Few teachers have taken college courses in computer science or general computer literacy courses. In general, most report that this is a new area that is expanding quickly. Teachers who have background knowledge in the field need to participate frequently in training and inservice programs to keep up to date with the new technological advances in the computer field. Many LEAs have noted that they believe the qualifications of the elementary computer learning teachers are inadequate due to lack of background knowledge and the fact that most teachers' knowledge in the field is self-taught.

Secondary Level

Secondary level teachers, on the average, are more likely to have advanced degrees in their subject than are elementary teachers.

Similar to the elementary teachers, secondary mathematics teachers seem to be the best qualified among those teaching any of the four subject areas. More secondary teachers in mathematics have their graduate degrees in the field than either science, computer learning, or foreign language teachers. In general, a larger number of mathematics teachers report having the necessary content background to teach the courses.

Science teachers also have adequate background knowledge in their field in terms of the number of college courses taken in their teaching subject. Both mathematics

and science teachers, however, have indicated a strong need for inservice training in order to keep abreast of current information. School districts have also noted that mathematics and science teachers at the secondary level need to take additional courses in their subjects in order to be up-to-date.

The secondary-level computer learning teachers also are perceived by the LEAs as more qualified than the elementary level teachers. They have more course credits in computer science and have had more hours of training. However, there is still a strong need for more inservice training, especially hands-on learning, for the secondary computer learning instructors. Since computer learning is not an established subject in many States, and since little information has been gathered on the subject even in States where it is a full program, it is difficult to make further generalizations.

The majority of foreign language teachers at the secondary level have a major or minor degree in their subject. Many, however, expressed a need for further training. In general, secondary foreign language teachers were rated as less qualified than either mathematics or science teachers in terms of majors and graduate training.

Summary

The data reported by the States on teacher qualifications were measured and presented differently. Usually, the States categorized the qualifications of teachers by the two levels: elementary and secondary.

At the elementary level, teachers seem to have had better background preparation and more inservice training in mathematics instruction than in science, foreign languages, or computer learning. While there does appear to be a need for further inservice in this area, States more frequently reported that elementary teachers needed inservice training in science, foreign languages, and computer learning instruction.

In general, at the secondary level there seem to be more mathematics and science teachers with more than 10 hours of training and a major degree in their subject. Mathematics teachers are in general more qualified than science teachers. The data reported on foreign language and computer learning teachers are scarce. Foreign language teachers do have the minimum background knowledge to teach the subject. They have, however, expressed a strong need for further education and inservice training. Computer learning teachers are participating in inservice programs yet need more background knowledge and formal training.

Availability of Materials and Equipment

States were requested to report on the adequacy of curricula, instructional material, and equipment for the subject areas of mathematics, science, computer learning, and foreign languages. Findings from the State reports regarding materials and equipment will compare the level of adequacy across States, highlighting priority need areas, and will provide specific information on textbooks and laboratory equipment. Reporting across States was the most consistent in this area, with 39 States using formats similar enough to be compared. However, the level of specificity for the four subject areas and school levels as well as the number of items reported varied from State to State.

Types of materials and equipment included in the categories also varied widely. Some of the items identified under the broad category of materials included textbooks, workbooks, lab materials, supplementary printed materials, audio-visual materials, laboratory supplies, classroom supplies, instructional resources (i.e., curriculum guides), calculators and mathematics manipulatives, and computer software. Equipment included laboratory equipment (both science and foreign language) audio-visual equipment, and computer hardware.

Throughout the State reports computer learning was defined in a variety of ways. Some States distinguished computer learning as a separate subject area, other States referred to it as a "tool" to assist learning in the subject areas of mathematics, science and foreign language, and some considered it primarily as equipment. A special section on computers will focus on the availability of hardware, teacher qualifications, and access to programming courses.

Materials and Equipment

Of the States filing EESA Title II reports with the U.S. Department of Education, three provided no information on availability of materials and equipment, and an additional seven provided only a cursory narrative summary, rather than complete quantitative information. It should be noted that Title II funds cannot be used to purchase equipment until teachers' training needs are met. Our assessment of need in the two broad categories of materials and equipment is based on responses from 39 States.

In most cases, LEAs reported availability of materials and equipment as either "adequate" or "not adequate." In these cases, we have considered availability Statewide

to be "not adequate" when more than 50 percent of individual LEA responses to the question of availability were recorded as "not adequate." In some cases, States asked LEAs to report availability on a scale ranging from "not adequate" to "very adequate," with one or more ratings in between. In those instances, we have tallied only responses of the lowest adequacy ranking as "not adequate." Again, the Statewide availability was considered "not adequate" only if more than 50 percent of responding LEAs fell into the "not adequate" field.

TABLE 1

Materials and Equipment*

Percent of total States submitting reports for which availability of materials and equipment is considered "not adequate"

	Mathematics			Science			Foreign Languages			Computer Learning		
	ES	MS	HS	ES	MS	HS	ES	MS	HS	ES	MS	HS
Materials	18	18	13	56	46	33	23	15	21	44	31	28
Equipment	41	38	28	69	64	51	26	28	28	41	31	23

ES = Elementary School; MS = Middle School; HS = High School.

* Based on reports from 39 States.

It should not be assumed that the number of States reporting "adequate" availability of materials and equipment is equal to the remainder when the number of States categorized as "not adequate" is subtracted from 39. This is because many of the 39 States on which these figures are based did not supply information for all categories. The rate of categorical nonreporting varied from zero in science equipment to over 40 percent in elementary foreign language equipment. The rate of categorical nonreporting fell between 15 percent and 30 percent in slightly over half of the 24 categories displayed in Table 1.

The availability data in Table 1 indicate that the subject area in greatest need of more materials and equipment was science. The percent of States reporting inadequacies in science materials ranged from 33 percent at the high school level to 56

percent at the elementary level. The need for science equipment is even more severe, as indicated by the fact that inadequacies ranged from 51 percent at the high school level to 69 percent in elementary schools. Inadequacies in materials for computer learning registered just below those in science, followed in decreasing degree of need by mathematics and foreign language instruction. Need for equipment in mathematics was about half the severity of need in science, followed closely by equipment deficiencies in computer learning and foreign languages.

When availability of materials and equipment is evaluated by level of instruction, it is at the elementary level that inadequacies are most obvious. This is particularly evident in the science category, in which 56 percent of the States cite shortages of materials and 69 percent note shortages of equipment in a majority of their LEAs.

Assessing the degree of inadequacies in materials versus inadequacies in equipment, the number of States needing equipment is generally one-and-a-half to two times greater than the number in need of materials for instruction in mathematics, science, and foreign languages. In the field of computer learning, however, there is a more equal degree of need for materials and equipment at all levels of instruction. Consideration of the subcategories under "materials" reveals a very low rate of need for textbooks at all levels and in all areas of instruction. Of the other subcategories under "materials" and "equipment" (see Table 2), the items most frequently reported to be in short supply were lab supplies and equipment at all levels and computer software at all levels.

From the various reporting measures of the States submitting needs assessments for EESA Title II, the categories of materials and equipment in which inadequacies consistently stand out are computer software and science laboratory equipment, while supplies of textbooks appear overwhelmingly adequate. More generally, of the 39 States reporting availability of materials and equipment in a quantitative format, over 80 percent report significant shortages of either materials or equipment at some level, and over 75 percent report inadequate availability of equipment in at least one level of one area of instruction. In addition, approximately 69 percent cite shortages of materials in at least one level of one area of instruction, and over 65 percent report need in both materials and equipment in some level or area of instruction.

TABLE 2

Laboratory Equipment and Supplies*

Total number of States reporting insufficient quantity of laboratory equipment and supplies

	Level		
	Elementary #	Middle/Junior High #	Secondary #
A. Science			
1. Facilities/Space	3	3	3
2. Equipment	10	7	9
3. Supplies	9	7	7
B. Mathematics			
1. Calculators	4	3	4
2. Manipulatives and other	3	4	4
C. Foreign Languages			
1. Facilities/Space	3	3	3
2. Equipment	4	4	6
3. Supplies	3	3	5
D. Computers			
1. Facilities/Space	1	1	1
2. Software	5	4	5

* Total number of States supplying quantitative information = 17.

Computers: Availability of Hardware, Qualifications of Teachers, and Availability of and Access to Programming Courses

Of the 16 States with substantial information on this subject, only six to eight States reported data in a comparable form. From data submitted by Delaware, Hawaii, North Dakota, and Wyoming, it appears that the average number of students per computer decreases at the higher levels of instruction. The rate of decrease varies from about 15 percent from the elementary level to the secondary level in Wyoming to roughly 50 percent in Delaware. The number of students per computer varies from a low of 12 at the secondary level in North Dakota to a high of 111 in Hawaii at the elementary level. In addition to the above States, Florida, New York, and Puerto Rico also supplied data, but none recorded data by level of instruction. Of these seven States, it is unclear if any States other than New York and Puerto Rico based student-to-computer ratios on the number of students who regularly use the computer or if the ratios were based on total enrollment (in New York, the number of students using computers on a regular basis represents only 24 percent of total enrollment Statewide, while in Puerto Rico, that number represents only 5 percent of the total school population).

Integration of computer use in the curriculum seems to be highest at the elementary level where one is more likely to find an integrated curriculum. Based on data from Alaska, Arizona, Delaware, Hawaii, North Dakota, and Wyoming (see Table 4), the average percent of classrooms integrating computer use seems to decrease from the elementary level to the secondary level (only one State reported an increase).

In the field of computer programming, five of the 16 States perceived a shortage of qualified teachers in light of current and anticipated demand for computer programming courses at all levels. Eight of the 16 States supplied no information on this topic.

Six States supplied specific data on efforts by teachers to improve their computer skills (see Tables 5 and 6). Although there is no indication of exactly how many teachers had received no training in classroom use of the computer, the majority of teachers in three of the six States had spent no more than 10 hours in computer training or staff development sessions. The majority of teachers in all six States received no more than 30 hours of training in this area, and fewer than 10 percent in each State reported spending more than 50 hours in computer training and development activities. In addition, five of the six States reported the percentage of teachers at

each instructional level who had spent some amount of time on their own learning how to use the computer or attempting to upgrade their skills. This ranged from a low of 8 percent of teachers at the elementary level in Hawaii to a high of 52 percent of teachers at that level in Wyoming. There appear to be no trends, however, in concentration of teacher initiative in computer skills development at any particular level of instruction. This information tends to parallel that provided by States on teacher qualifications generally, as reported above.

Finally, States were asked to provide information on the number and types of programming courses offered in their LEAs, and they were also asked to note whether access to programming courses was restricted in any way. Of the seven States providing adequate information in this area, all seven indicated that some programming courses were provided at the secondary level, most often in BASIC but also, to a limited degree, in Pascal, COBOL, Fortran, and Logo. Only three States indicated availability of programming courses at the elementary level, and most were in either BASIC or LOGO.

TABLE 3

Average Number of Students Per Computer Statewide

	DE	FL*	HI	NY**	ND	PR*	WY
Elementary	42	32	111	99	36	20	20
Middle	27	32	97	99	13	20	14
Secondary	18	32	85	99	12	20	16

* Information not broken down by level of instruction.

** Includes only microcomputers, not terminals. Information is based on the total number of schools Statewide that have computer hardware.

TABLE 4

Percent of Classrooms Integrating Use of the Computer in the Curriculum

	AK	AZ	DE	HI	ND	WY
Elementary	60	44	27	8	46	54
Middle	52	32	19	14	21	43
Secondary	12	24	23	15	20	44

TABLE 5

Percent of Teachers Who Have Received Training or Staff Development in How to Use Computers in the Classroom

	AK	DE	HI	PA	ND	WY
0-10 hours	38	63	46	55	64	50
11-30 hours	35	22	18	25	23	27
31-50 hours	25	10	13	13	7	15
50+ hours	2	5	6	6	5	8

TABLE 6

Percent of Teachers Who Have Spent Their Own Time Learning How to Use the Computer

	AK	HI	PA	ND	WY
Elementary	25	8	24	37	52
Middle	42	8	23	34	43
Secondary	20	13	28	32	39

Access

States were asked to report on the degree of access to instruction in mathematics, science, foreign languages, and computer learning of historically underrepresented and underserved populations and of the gifted and talented. The type of information provided by the States varied considerably. The focus of a majority of reports was the current status of access. Some States interpreted access to mean that students had "equal access" to programs. In some reports, the interpretation of access varied depending on the special group addressed. For example, several States reported actual enrollments for females and minorities, while indicating that gifted and talented and handicapped students had equal access to all courses. Other States reported projections on access over the next five years, while in some cases also including current information and in other cases not reporting on current status. Rather than actual enrollments, some reports contained the number of school districts reporting having proportional enrollments in the four subject areas.

To obtain the results regarding the question of access, many States conducted a needs assessment survey of the school districts. When reviewing the results of these surveys, it is important to realize that often less than half of the school districts responded to the survey. The representativeness of those school districts that did respond is usually not addressed in the State report. Similarly, many of the reports did not contain information for all special populations and/or for all subject areas. The type of courses included in the survey varied somewhat across the States. For those States reporting access for the four general subject areas, a presumption can be made that all courses in each subject area have been included in the survey. Other States only reported access information for higher level courses at the secondary level.

The comparability of student groups discussed in the reports is a problem. Some States chose to report on the access of the one general category of "underserved, underrepresented." Separate reporting on the handicapped did not indicate whether the entire handicapped population was included, or only those students mainstreamed into regular education.

The variety of formats used to report access information requires that summaries be limited to specific formats, reporting on those States that provided comparable data. From among the many different approaches to measuring access reported by the States, consistent information has been pulled together for 25 States, using three measures, as

reported below. General findings will then be highlighted for each of the four student populations: females, minorities, handicapped, and gifted and talented.

Several States chose to report access by using a CCSSO table requiring the State to report the number of students in each special group enrolled in secondary higher level mathematics, science and foreign language courses. Nine of these States included overall State enrollment figures making it possible to determine whether the enrollments reported for individual courses were proportional or not. Table 7 summarizes the number of States reporting proportional and nonproportional enrollments by individual subjects for each special group. Not all States reported enrollment of every special group by every subject.

Proportional enrollments for females were reported at 54 percent. In addition, it should be noted that many of the responses recorded as nonproportional were often very close to, while still below, the overall State enrollment numbers for females. The three courses with the highest nonproportional responses included Physics I, Statistics, and Calculus. The highest number of proportional responses were reported for Biology II, Pre-Calculus, and fourth year foreign language courses.

The majority of responses for black, non-Hispanic students were nonproportional. The highest number of nonproportional responses for this group were reported for Physics I, Pre-Calculus, and Calculus. The highest number of proportional enrollments were reported for Chemistry II and Biology II. A little more than half of the responses for the Hispanic population were not proportional. Enrollment of Hispanics was least proportional in Physics I and most proportional in 3rd year foreign language.

The majority of States reported handicapped enrollment to be nonproportional in all higher level courses. However, one State reported proportional enrollments in Physics I and third year foreign language. The gifted and talented population is overwhelmingly proportional in all individual courses. One nonproportional response was reported for Biology II and Pre-Calculus.

Biology II stands out as the course most likely to have proportional enrollment across all groups, while Chemistry II enrollment tends to be nonproportional for a majority of special groups.

Eleven other States provided some non-quantitative indication of the adequacy of access for at least some special populations and subject areas. Seven of the States reported that, across the four subject areas, female enrollment was generally considered adequate. The subject area most likely to have adequate enrollment was foreign language at the high school level. Science and Computer learning at the high

TABLE 7

Enrollment of Historically Underreported and Underserved Groups

The number of States reporting proportional and nonproportional enrollments for grades 9-12 for each of the following groups who were enrolled as of Fall, 1985, in each of the courses listed below. (Grades 9-12)

	Sex		Ethnicity								Special Populations			
	Females		Black Non-Hispanic		Hispanic		Asian or Pacific Islanders		American Indian/ Alaskan Native		White Non-Hispanic		Handicapped		Gifted and Talented	
Science	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N
Chemistry II	4	4	3	6	3	4	6	2	4	3	4	2	0	7	7	0
Physics I	3	5	1	8	2	6	7	1	4	3	6	1	1	6	7	0
Biology II	6	2	3	6	3	4	7	1	4	3	5	2	0	8	6	1
Mathematics																
Pre-Calculus*	6	2	1	8	3	5	8	1	3	4	6	1	0	7	7	0
Statistics	1	6	1	7	2	4	3	3	4	2	3	2	0	6	5	1
Calculus	3	5	1	8	5	3	7	1	4	4	4	3	0	7	7	0
Foreign Languages (All Languages)																
Third Year Courses	4	2	2	5	4	3	6	1	3	3	4	2	1	5	6	
Fourth Year Courses	5	1	2	5	2	3	5	1	3	3	3	3	0	6	6	

* (Or Mathematics 4 or Trigonometry/Analytical Geometry)

Number of States Reporting = 9

P = proportional
N = Not proportional

school level were most likely to be rated inadequate. Six States reported that minority enrollment was generally considered adequate. Elementary and high school mathematics stand out as the areas most likely to reflect adequate enrollment of minorities. Finally, five States reported the status of access by prioritizing the most critical need areas. Across these States, mathematics for the minority population stands out as the most critical area of need, followed closely by science for minorities.

Summary

Females

While overall access for females was reported as generally adequate, this group tended to be underrepresented in science and computer learning courses and to a lesser extent in some honor and advanced mathematics courses. Females tended to outrank males in foreign language courses, particularly in 4th year courses. Across States, females usually were enrolled at a low level in Physics I, Calculus, and Statistics, and at a high level in Biology II and foreign languages. States reporting by narrative also tended to confirm this pattern adding that Chemistry II also ranked low.

Minorities

Access for minorities was generally reported as low to adequate. However, proportional enrollments in higher level courses varied considerably depending on the particular ethnic group. Asian or Pacific Islander enrollment was reported as proportional by 82 percent of the respondents, while Black enrollment was proportional in only 20 percent of the responses. States reporting narrative information only generally confirmed that minority enrollments were disproportionate or that access was inadequate, particularly for higher level courses. Often Black students were the most underrepresented, usually rated first or second (behind handicapped). Programs for minority students were ranked as top priorities, particularly in mathematics and science.

Handicapped

Several States did not address the needs of the handicapped in their report on access. For those States that did, only the State of Mississippi provided some indication of the representativeness of the group: "For handicapped students who may not be capable of competing in regular mathematics, science or foreign language programs, it would be assumed that self-contained classes provide more functional programming to meet their needs." A few States referred to barriers that prevented participation of these groups in mathematics, science, foreign languages, and computer

learning, but failed to elaborate on these barriers. Access was generally nonproportional. Assuming that the entire handicapped population is included in reporting on enrollment in upper level regular programs, it may be reasonable to find this population underrepresented. If this group includes only those handicapped students who are mainstreamed into regular programs, then nonproportional enrollment reflects inadequate access.

Gifted and Talented

The notion of access for gifted and talented students seems less relevant, since one would expect these students to be proportionally enrolled in these subjects. However, for many States, the issue was the significant lack of special program options for the gifted and talented. Some States provided information on the number of elementary and secondary schools providing such special programs. For the most part, the proportion of schools at both levels was generally low.

PROGRAMS/INITIATIVES

As part of the needs assessment, States were asked to "describe(s) the programs, initiatives and resources committed or projected to be undertaken within the State to improve" teacher qualifications, curricula and access. While a few States relied on their application for Title II funds to supply the required description of programs, most States included in the needs assessment report at least a summary of programs and initiatives. As was true of the needs assessment data described earlier in this report, there was considerable variation in the scope and detail of the information States provided. Some States chose to include broad discussions of the general educational reform efforts/school improvement movement that have been or are taking place. Presumably such efforts are likely to have an impact on the quality of instruction in the particular subjects with which Title II is concerned. Some States provided information only on the local (LEA) and/or Statewide activities funded through Title II; others included Statewide programs and initiatives regardless of funding source, including private funds.

In order to provide some consistency in the information reported here, this discussion will be limited to specific topics and to those States that provided substantially parallel data. The following summary will focus on those programs and initiatives directed specifically towards improvement in science, mathematics, foreign language, and computer instruction. Local activities are briefly summarized, but the

primary focus is a description of the programs and initiatives that are Statewide in scope or at least extend beyond a single local district activity. Of the 52 reports on which this summary is based, seven States provided no information on programs and/or initiatives in the areas of teacher qualifications and curriculum development. Another six States only described LEA activities. Thus, the summary of Statewide activities is based on information provided by 39 States. With respect to programs to increase enrollment among the traditionally underserved, 5 States did not provide any information, 15 only provided the number of local school districts operating various programs and services and 31 States also included some discussion of Statewide initiatives. Because the regulations concerning the needs assessment reporting requirement did not define the programs, initiatives, or resources to be included in the report, any summary based on those reports will understate the activities undertaken or planned. The following discussion cannot therefore actually assess the scope of the activities taking place in the States. To the extent, however, that what was reported is reflective of the types of activities and initiatives undertaken recently, the following can provide a useful summary.

In most cases, the information on programs in the State reports could not be quantified beyond noting the number of States reporting on activities in a particular area. Counts of actual programs could not be reliably drawn from the reports since the same activity was frequently described several times depending on the objective being discussed. It is not uncommon for a single State project to include efforts to improve the qualifications of current teachers, to revise the curriculum and to address the issue of increasing the enrollment of traditionally underserved populations. An example of a project that addresses all these concerns is Montana's "Excellence for Montana Math Education" project (EMME) which includes inservice training to elementary school teachers to update their content knowledge and improve instructional strategies. One component of the project is the "Gender Expectations and Student Achievement" (GESA) module that is designed to increase teacher awareness of the need to encourage students to pursue mathematics studies.

The following section begins with a brief summary of the information provided on local projects to improve teacher qualifications and curricula and then describes Statewide initiatives in each of the four subject areas. The final section reviews the information on local and Statewide activities to improve access for different groups of students - females, minorities, handicapped and gifted and talented.

Local Projects

It was not always possible to distinguish between teacher improvement activities and those directed towards revising and improving the curriculum in one of the four subject areas. Much of the recent concern with the quality of mathematics and science instruction as taught in elementary and secondary schools has focused on not only the need to introduce new subjects, such as probability and statistics, but also on the need to develop critical thinking skills. To introduce these improvements requires changes in the way teachers teach as well as in the curricular content. Focusing programs and initiatives on these topics can thus be viewed as an effort to improve the quality of the teaching as well as an improvement in the curriculum. Such a focus also suggests increased needs for equipment. In what follows, a distinction is made between those activities specifically focusing on these new topics and those which were described in more conventional terms. Since this report has focused on the needs associated with the current teaching force and not the supply and demand issues, the summary of programs is also restricted to inservice training and other activities related to those currently teaching these subjects and does not include recruitment or teacher training initiatives.

A considerable number of States noted the local school district activities that are being undertaken, primarily with Title II funds, to improve the qualifications of current teachers or the curricula in these subjects. Although a better picture might be obtained from an analysis of the funding applications, which were not available, some sense of the trends in the nature of these activities can be obtained. Of the LEA activities directed toward improving teacher qualifications in science, thirty-eight percent of these activities specifically focused on problem-solving and the use of new technology, and another 18 percent of the projects mentioned updating content knowledge to include new developments. In mathematics, 36 percent of these local activities focused on a hands-on approach or emphasized problem-solving, while 10 percent mentioned new content areas. States frequently did not note whether projects were directed to the elementary or secondary level or both. Since in most States only secondary teachers get certified in particular subjects, it can probably be assumed that unless the elementary level was particularly mentioned, the focus was secondary. In any case, only 20 percent of the science projects and fourteen percent of the local mathematics projects described mentioned a specific elementary focus.

Thus, the majority of local projects involved traditional inservice techniques to reinforce basic concepts and knowledge in these subjects at the secondary level. Under the legislation, the first priority for local projects is mathematics and science inservice training and very few States mentioned any local activities directed towards foreign language or computer learning inservice training.

Statewide Initiatives

Before describing in detail the Statewide programs and initiatives to improve the qualifications of teachers and curricula, it should be noted that a number of States listed increased requirements and standards as initiatives. Technically, an increase in the number of credit hours of science required for high school graduation is an improvement in the curriculum, yet these increased requirements set by the States have in fact only set the stage by increasing the need for qualified teachers in these subjects and for the development of curriculum guides and other instructional materials for the newly required courses.

Mathematics

Statewide initiatives to improve mathematics instruction leaned somewhat more heavily toward activities designed to improve the background of current teachers than toward curriculum development. Standard inservice techniques were most typical - a series of workshops for teachers around the State, summer institutes or seminars - and usually focused on firming up teachers' understanding of the basics in the mathematics curriculum. Curriculum initiatives, on the other hand, were more likely to involve SEA staff work, for example, the development of new guides, supplementary materials, recommended model programs, or lists of appropriate resources or materials. In many cases, the focus of these State activities was on modernizing the approach through an emphasis on problem-solving or updating the content by including new topics such as probability and statistics or number theory, encouraging the use of manipulatives, or providing guidelines for the use of calculators and/or computers. For example, the Florida SEA produced a book on Standards of Excellence in Math which covered such topics as problem-solving strategies, estimation and approximation, probability and statistics, and the use of calculators and computers in elementary mathematics. Curriculum activities or initiatives were somewhat more likely to include elementary school, especially since some States were revising the entire curriculum (K-12). However, a specific emphasis on elementary school mathematics instruction was mentioned in conjunction with less than 20 percent of these activities.

Science

The picture regarding Statewide initiatives to improve science instruction is very similar to that for mathematics. The main emphasis has been on inservice workshops, summer institutes, or seminars to improve the background and content knowledge of current science teachers. State curriculum development activities - new guides and lists of resources, etc. - focused primarily on the inclusion of new information rather than on "process" science or experimental methods. A few initiatives also focused on improving the lab equipment for science instruction. Illinois has set up a Clearinghouse for Laboratory Equipment where State agencies can contribute surplus equipment for LEAs to use. As was the case for mathematics, few of these initiatives, whether primarily concerned with teaching quality or with curriculum, focused specifically on the elementary school.

The overall picture for mathematics and science is the predominance of a variety of fairly traditional and basic inservice activities to reinforce teaching skills and occasionally add a little spice to the curriculum. Some more novel initiatives included a special program to get businesses to employ science teachers in the summer to learn practical applications in their fields and the establishment in several States of mathematics and/or science academies intended to stimulate model program development, pilot instructional techniques, and provide inservice materials and training staff.

Foreign Languages

Only nineteen States mentioned any Statewide initiatives or activities concerned with improving teaching or curricula in foreign languages. Many States noted in their reports that foreign language instruction is virtually absent at the elementary level and not required in secondary school. Only five projects specifically mentioned a focus on elementary school. The following two examples give an indication of their diversity. In Florida, the State matches local funds for districts that start programs in elementary language instruction through the Foreign Languages in the Elementary School program (FLES). In Arkansas, a committee of foreign language teachers is working with the SEA to develop a series of lessons and activities to introduce instruction in elementary schools. The lessons will be distributed to all elementary teachers in the State. At the other extreme are several States whose main concern is to make foreign language instruction available as an option at least in all secondary schools. Montana, for example, is reviewing the use of technology to bring minimal

foreign language instruction to geographically isolated small schools, and Utah has a similar project. Of the thirty-nine Statewide projects described in the State reports, most are fairly basic inservice projects - summer institutes to improve skills, and/or SEA consultants to provide technical assistance to districts. Although the parallel to problem-solving in mathematics and science is oral proficiency in languages, few of the reports mentioned a concern or focus on this area in the language projects they had initiated. Only one State - Michigan - mentioned efforts to encourage the addition of a new language to the curriculum (Japanese). While such courses may be introduced more widely, it does not appear to be at the initiative of State education agencies.

Computer Learning

Computer learning usually was viewed as computer literacy in the lower grades and programming courses in the upper grades. However, States varied widely in the extent to which they considered computer learning a specific subject for instruction, a kind of instructional technology that needs to be integrated into the classroom regardless of the subject of instruction, or simply as a type of instructional equipment. Twenty-four of the thirty-nine State reports described initiatives involving computer learning viewed in one or the other of these three perspectives. Seventeen States mentioned activities involving computer education as a special subject. Most frequently, these were workshops and/or seminars for teachers or the development of curricular guidelines by SEA staff. Twenty-four States mentioned initiatives related to the integration of computers into classroom instruction. A number of these States (eight) had established centers to demonstrate computer hardware, evaluate software for teachers, and provide technical assistance on integrating the computer into instruction. For example, Michigan has a project called TIME (Technology in Michigan Education) that consists of five regional centers to evaluate software, develop training modules and provide staff development resources. Similarly, the Utah SEA runs a Technology Demonstration Center that performs hardware and software reviews and provides consulting services to LEAs. States have also been fairly active in developing curriculum materials and guidelines on the use of computers in instruction. In addition, four States specifically mentioned special appropriations to enable local school districts to buy hardware and software. Only a few States had initiatives on computer learning that covered all three perspectives. New York, for example, has fifty-seven Teacher Resource and Computer Training Centers that train teachers in the use of computers, evaluate computer related materials and provide services to science, mathematics, and computer technology teachers. In addition, the State has new

Computer Hardware and Computer Software Purchase Programs that provide State funds for LEA purchases.

Access

States were also supposed to report on programs and initiatives to improve the access of traditionally underserved student groups. As noted above, the question of the degree of access that currently exists was answered in different ways by States depending on how they interpreted or defined the term. The fact that courses were available to all was a minimal definition of access for some States. The CCSSO survey included a tabular question on the types of activities currently undertaken by local school districts to improve access. Seven States used this table to report local activities, while eleven others described local activities in a more summary fashion without detailing the types of activities or the specific groups toward which the activities are directed. D.C. and Hawaii, both of which act as single, unified school districts, noted that some program activities for all groups in all subjects took place in their jurisdiction. Three States indicated that over fifty percent of their local districts had activities in at least some subject for some groups, and another three States reported that approximately a third of the districts were involved in special efforts to encourage participation. It was noted that the focus was predominantly on encouraging mathematics and science enrollment for gifted and talented students. Finally, three States indicated that a fourth or less of their school districts had taken some initiatives to improve access, again primarily encouraging gifted and talented enrollment in mathematics and science. California, which noted that twenty-four percent of the teachers reported special activities, was the only State to make an evaluative comment about all this local effort. "Schools have implemented career counseling and recruitment programs to induce balanced enrollment in mathematics, science and foreign language courses with only marginal success."

Table 8 indicates the range in the percent of districts that States reported were undertaking efforts to improve the access of girls to courses in these subjects. It is evident that very few States report more than fifty percent of the districts doing anything at all. The most common activities are likely to be inservice training to teachers to increase their awareness of the need to encourage students to participate, particularly in mathematics and science. Several districts in one State had implemented

TABLE 8

States Reporting on the Range of Districts Operating Programs to Improve Access for Girls*

Secondary Grades 9-12	Mathematics				Science				Foreign Language				Computers			
	% of Districts															
	0-25	26-50	51-75	76-100	0-25	26-50	51-75	76-100	0-25	26-50	51-75	76-100	0-25	26-50	51-75	76-100
Inservice on the need to identify and counsel students	3	3	0	1	3	3	0	1	6	0	0	1	4	2	0	1
Special programs for students to introduce them to career opportunities	4	1	1	1	3	2	1	1	5	1	0	1	4	2	0	1
Efforts to expose students to women or minority role models	3	2	1	1	3	2	1	1	6	0	0	1	5	1	0	1
Efforts to increase teachers' awareness of classroom behavior encouraging or discouraging students	1	5	0	1	2	4	0	1	4	2	0	1	3	3	0	1

* Total = 7

EQUALS, a nationally disseminated program to encourage both women and minorities to pursue mathematics studies.

At the State level, five States indicated they held EQUALS conferences or workshops throughout the State. Other similar approaches to encouraging female enrollment were also mentioned by several States as initiatives, such as "Expand Your Horizons," GESA and others. Another typical type of Statewide initiative was SEA development of sex equity guidelines and the establishment of coordinators essentially to monitor access problems. Awards to recognize girls' achievement and conferences to increase career awareness were also noted as activities by a few States.

The picture on programs to improve the access of ethnic minorities is a similar one. Table 9 presents the information for the States using the CCSSO format to report local activities. For most of these States, less than a fourth of the districts report any special programs. The most typical activity involves developing teacher awareness and providing appropriate role models. Frequently, the Statewide initiatives reported combined efforts to encourage enrollment for girls and minorities. Many of the activities listed for girls above also concerned minority participation. In general, local activities directed toward improved access for these groups tend to be somewhat more likely to involve teacher training, rather than student oriented programs but the difference in emphasis is slight.

Although migrant students were included in the student groups in the CCSSO survey, the reported data is scarce. Since migrant students tend to be concentrated in only some districts, most States reporting local activities reported fewer than twenty percent of the districts making special efforts to increase the access of migrant students. Almost no Statewide initiatives for migrants were reported.

As discussed in the needs section, it is not clear how access should be defined for handicapped children. For those special education students in separate classes, enrollment in regular mathematics, science, foreign language, and computer courses may not be appropriate, making a determination of the need for improvement in access difficult to measure. Given these definitional issues, it is unclear what activities districts were considering when the CCSSO question was being answered. Table 10 presents that information. The most common activities appear to be teacher inservice training on the need for counseling students, and awareness of behaviors to encourage students to participate in studying these subjects. Activities related to role models and career opportunities are not common. In terms of Statewide initiatives, two States mentioned conferences and efforts to provide inservice on how to teach science and

TABLE 9

States Reporting on the Range of Districts Operating Programs to Improve Access for Minorities*

	Mathematics				Science				Foreign Language				Computers			
	% of Districts															
Secondary Grades 9-12	0-25	26-50	51-75	76-100	0-25	26-50	51-75	76-100	0-25	26-50	51-75	76-100	0-25	26-50	51-75	76-100
Inservice on the need to identify and counsel students	5	1	0	1	5	1	0	1	5	1	1	0	5	1	0	1
Special programs for students to introduce them to career opportunities	5	0	1	1	5	0	1	1	6	0	1	0	5	1	0	1
Efforts to expose students to women or minority role models	5	0	2	0	5	0	2	0	6	0	0	1	6	0	0	1
Efforts to increase teachers' awareness of classroom behavior encouraging or discouraging students	3	3	0	1	4	2	0	1	5	1	1	0	5	1	0	1

* Total = 7

TABLE 10

States Reporting on the Range of Districts Operating Programs to Improve Access for the Handicapped*

Secondary Grades 9-12	Mathematics				Science				Foreign Language				Computers			
	% of Districts															
	0-25	26-50	51-75	76-100	0-25	26-50	51-75	76-100	0-25	26-50	51-75	76-100	0-25	26-50	51-75	76-100
Inservice on the need to identify and counsel students	3	4	0	0	3	3	1	0	5	1	0	1	4	2	0	1
Special programs for students to introduce them to career opportunities	3	4	0	0	3	3	1	0	5	2	0	0	3	3	0	1
Efforts to expose students to women or minority role models	6	1	0	0	6	1	0	0	6	1	0	0	7	0	0	0
Efforts to increase teachers' awareness of classroom behavior encouraging or discouraging students	2	5	0	0	3	4	0	0	5	2	0	0	3	4	0	0

* Total = 7

mathematics to the handicapped. Three States mentioned specific projects, one to develop an elementary science curriculum for the mildly handicapped and the others to use computers to teach mathematics and science to the mildly handicapped.

States also reported on the kinds of local activities to encourage access for gifted and talented students, using the CCSSO format. Teacher inservice training on identifying and counseling students and on awareness of classroom behavior were the most common. Given the likelihood that gifted and talented students would be overrepresented in advanced classes in these subjects, it is difficult to imagine the content of these activities. Presumably, districts may have been referring to special inservice activities for teachers in already established gifted and talented programs. Aside from general programs for these students, the main thrust of Statewide initiatives was the establishment of special academies or schools, sometimes summer only and sometimes for the regular term, to allow gifted and talented students in the State to pursue advanced studies. The establishment of such special schools was mentioned by seven States. As noted earlier, special programs to encourage enrollment in the subjects with which Title II is concerned are mostly for gifted and talented students. The needs of those students historically underrepresented, such as women and minorities, are less likely to have been addressed at the State or local level.

CONCLUSIONS

States, and particularly State education agencies, have clearly been stimulated by EESA Title II to consider their needs and develop initiatives in mathematics, science, and, to a lesser extent, computer learning and foreign languages. However, a perusal of the State needs assessment reports also makes clear the difficulties in defining the most pressing needs and pursuing activities that go much beyond traditional approaches to inservice training, at least at the level of Statewide programs.

EESA Title II places primary emphasis on science and mathematics and this is reflected in the information available from the State reports. The greatest need for improvement in teacher qualifications appears to be in science teaching at the elementary level. Many States expressed concern about the lack of background of elementary teachers in science. Lesser, but still pressing needs were typically expressed for elementary mathematics, particularly the need to improve problem-solving approaches to instruction. At the secondary level, the major concern appears to be the need to update the content knowledge for teachers in these fields. The picture of

weakness in elementary science is reinforced by the needs assessment information on materials and equipment, which suggests that the greatest need is for materials and particularly for equipment for the elementary science curriculum.

The description of programs and initiatives in these two subjects indicate that inservice activities have primarily focused on reinforcing content knowledge of teachers at the secondary level. Only a few States have focused specific initiatives on instructional strategies and new approaches to elementary science and mathematics. Similarly, only a small number of States mentioned specific initiatives to deal with the need for science equipment.

In the area of computer learning, it is clear that the States are still struggling to define computer learning and its place in the curriculum. In many cases, it is not yet an approved subject for instruction, although a number of States noted that they were developing curricula. Many teachers teaching computer courses have thus been self-taught and States noted a need for more formal instruction and background. The most common perspective, however, was to view computers as a tool for instruction in other subjects, and teacher training programs in this area were operating in almost half the States. As microcomputers are brought into greater use in the classroom, more States have recognized a need for additional hardware and software. Only four States, however, mentioned special appropriations to meet this need.

Foreign language instruction remains minimal at both the elementary and secondary level in many States. Yet the needs assessment reports suggest that this is not always considered a serious deficiency. Certainly few States indicated any consideration of the need for or programs to provide foreign language instruction in elementary school. At the secondary level, the main concern was to ensure the availability of at least some minimal level of instruction to all high schools. Questions about what languages to teach or whether instructional techniques were appropriate were seldom noted in the reports.

Title II also focuses attention on the issue of the access of particular student groups to these areas of study. In general, most States appear to be aware of a need to do more to improve the enrollment of females and minority students in advanced mathematics and science courses. Approximately one-fourth to one-third of local districts are reported to be doing something to improve access for these groups, and a few States reported Statewide initiatives. Urging teachers to deal with this problem seems to be the most common approach.

Steering the brightest students into careers in these areas is an appropriate national concern highlighted by EESA. While general gifted and talented programs are fairly common, however, only a few States have specific initiatives to provide advanced study in mathematics and science and to encourage the gifted students in careers in these areas. Typically, these activities involved special academies or schools for advanced study for a small group of selected students Statewide.